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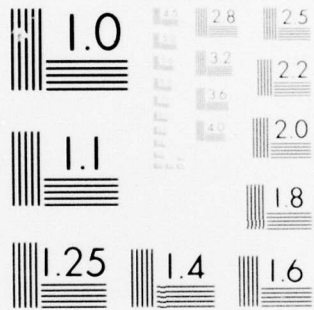
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AMERICAN EMBASSY

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THE SEMICONDUCTING PROPERTIES OF CdSb INTERMETALLIC COM-
POUNDS

Professor E. Justi and G. Lautz (Department of Technical Physics, Braunschweig) have investigated the semiconducting properties of stoichiometric cadmium antimony, CdSb. The conventional stoichiometric intermetallic compounds, such as AuCu, show minima in their specific resistance at concentrations corresponding to simple formulae. In marked contrast to these, a sharp maximum was obtained at the stoichiometric concentration for the intermetallic compound between cadmium and antimony; resistance increases amounting to four or five orders of magnitude were observed. The temperature dependence of the electrical resistance was determined between 10 - 700°K and follows a typical semiconductor dependence. The Hall effect is positive throughout the whole range of concentrations and it is concluded that the CdSb samples used are deficiency semiconductors. The mobility of the electrons in this intermetallic compound was determined from the dependence of resistance on magnetic field. The expected quadratic dependence was observed at the temperatures of boiling hydrogen, liquid air or room. The mobilities observed ranged from 350 - 600 cm²/volt. sec.

In accordance with expectations based on the results obtained, the CdSb compound was found to be a good rectifier; it is primarily of the p-type. The rectifying properties of this simple, inexpensive substance may find practical applications.

Further details about this work and other research in progress in this Department dealing with a wide variety of problems in metal and solid state physics are described in Technical Report ONRL-137-52. This report is available from the Technical Publications Office, Code 250, Office of Naval Research, Washington 25, D.C.

DIURNAL VARIATION OF AIR SHOWERS

In order to follow up on preliminary measurements which have claimed diurnal variations in extensive air showers (Phys. Rev. 83, 600 (1951)), Dr. H. Elliot at Manchester has undertaken a more elaborate experiment in order to detect periodic variations in extensive air showers. The experimental set-up consists of nine trays of Geiger counters each of area 40 x 40 cm. They are arranged in three groups. Each group is put at the corner of a large triangle whose sides are 150, 290, and 300 meters respectively. Triple coincidences are obtained within each group and then further coincidence between groups are recorded. The rate for any two groups in coincidence runs to a few per day, the rate of all groups going (ninefold coincidence) runs to about two per week. As a result of some thousand counts, no sidereal or solar variation greater than 2 per cent has been discovered for the 150 meter separation. However a large solar diurnal variation of amplitude 25 to 30 per cent is observed for the 300 meter separation with a maximum near midday. This result which is based on about 400 showers is quite significant statistically; the probability of such a variation being due to chance is about 1 in 500.

This effect has not yet been explained; an attempt is being made to see if it could be due to a photodisintegration of heavy primaries under the influence of solar radiation. This effect was recently proposed by G.T. Zatsepin (Doklady Akad. Nauk, 80, 577 (1951)) to account for the existence of very extensive showers in terms of correlated primaries. It should lead to a large solar diurnal variation.

ELECTRON SHIFT BETWEEN ADSORBATE AND ADSORBENT

Professor R. Suhrmann (Braunschweig) is investigating the electron shift between adsorbate and adsorbent using the techniques of photoemission and electrical conductivity. The fundamental principles and early results have already been described by these workers. (Z.f. Elektrochem., 56, 351 (1952)).

Recent resistance measurements carried out with simple adsorbates on nickel films, gave the following results for the percentage change in electrical resistance:

Argon $\Delta R = 0$, as expected
 H₂O $\Delta R = -0.16$ per cent at 90°K
 N₂O $\Delta R = + 3.3$ per cent at 90°K
 CO $\Delta R = + 1.2$ per cent at 90°K

The ΔR observed for water is the same as that previously observed for hydrogen and suggests that in both cases adsorbed hydrogen atoms may be responsible for the effect.

Both the electrical resistance and the photo-emission techniques are now being applied to a study of organic adsorbates and may yield information concerning the "availability" of π electrons of aromatic systems to metallic surfaces. The reductions in electrical resistance observed are extremely small and thus the results are not yet of quantitative value. The results obtained were: benzene, 0.05 per cent; naphthalene, 0.035 per cent; and triphenylmethane, 0.034 per cent. The addition of aromatics to the surface produces a gradual rise in the photoelectric sensitivity (i.e. the ratio of electron emission to intensity of irradiation) of the surface until the surface is covered with the adsorbate; at this point a sharp drop occurs.

Further details about this, and some other work in progress at Braunschweig, dealing mainly with the nature of the addition compounds formed between aromatics and alkali atoms, can be found in Technical Report ONRL-138-52, available from the Technical Publications Office, Code 250, Office of Naval Research, Washington 25, D.C.

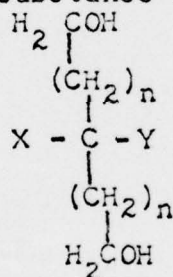
EMERGENCE OF SPONTANEOUS OPTICAL ACTIVITY IN NATURE

The application of occlusion compounds of various types for the spontaneous optical resolution of certain racemic mixtures is being investigated actively in several European laboratories at the present time (cf. ESN 6, 216 (1952); Nature 170, 155 (1952); JCS 3747 (1952); Experientia 8, 337 (1952)). H.M. Powell (Oxford) also suggested (Nature, loc. cit.) that the development of optical activity in the course of a crystal growth process may provide an explanation for the origin of optical activity in nature.

It may be of interest to draw attention to the fact that somewhat similar ideas, convincingly substantiated by experimental evidence, were advanced by E. Havinga of Leiden University over a decade ago. In a somewhat inaccessible paper in Chemisch. Weekblad 38, No. 46 (1941) entitled "On the Possibility of Spontaneous Asymmetric Synthesis" he developed the concept that if certain conditions are satisfied

a suitable substance will transform spontaneously from the inactive into the active modification. The conditions required are the following: (1) on crystallization, 1 and d crystals are obtained primarily in preference to a racemic compound; (2) the relative rate of nucleation is slow compared to the processes of crystal growth and racemization (in the liquid phase). Havinga found that methylethylallylphenylammonium iodide in chloroform satisfies these requirements and in a series of fourteen experiments obtained striking confirmation of the development of optical activity. The results were distinctly positive in twelve of these fourteen trials. While, at that time, he did not explicitly choose between the two possibilities that the first "living" substance was already optically active, or that optical activity "developed" from inactive materials, his results clearly provide a possible mechanism for the latter possibility.

Another stimulating suggestion contained in Havinga's work (loc. cit.) dealt with the possible formation of an optically active substance at the air-water interface. Molecules of the type



can form a two-dimensional crystalline phase at the air-water interface. Assuming that one of the two CH_2OH groups is in the water while the other one is outside of it, oxidation of the one in the water (with, for example, permanganate) yields an optically active product. The occurrence of such an event in nature appears possible.

INFLUENZA OUTLOOK IN GREAT BRITAIN 1952/53

The relative freedom from virus influenza enjoyed by the people of Great Britain last winter was shared by the rest of Europe and by North America. It is of interest to note that up to the end of August 1952 the presence of outbreaks of Virus A, so widespread a year previously, had not been reported to any extent from either of the above continents, in both of which special arrangements had been made for the early reporting and laboratory investigation of influenza-like outbreaks.

The presence of Virus A was however reported from South Africa in June of this year, i.e., the South African winter. If events in the coming winter follow the experience of two years ago, the appearance of influenza Virus A in South Africa in June may again be followed by its occurrence in Northern Europe six months later. On the possibility that this may occur, and it is indeed in keeping with the biennial cycle of epidemics involving Virus A, special precautions are being taken by the Ministry of Health's epidemiological section and its laboratories, and by the general practitioners who will act as "spotters" to furnish immediate reports on new outbreaks.

As regards ports and airfields, medical officers attached to these installations have been instructed to report to the Senior Medical Officer at the Ministry the occurrence of influenza-like disease aboard ship or among passengers and aircrews arriving in Great Britain.

Should such outbreaks occur, it is planned that the Medical Research Council, Influenza Vaccine Trials Committee, will be able to make arrangements for a control field trial of the vaccine of choice under whatever epidemic conditions the winter of 1952/53 may hold in store.

INSECTICIDE RESISTANCE STUDIES IN ITALY

An extensive research program has been undertaken at the Istituto Superiore di Sanita in Rome to study the manner by which insects become resistant to the action of the newer insecticides such as DDT, and particularly the mechanism by which resistance has developed in Musca domestica and its several varieties found in Italy.

Dr. S. Bettini and Dr. M. Boccacci have assumed that in insects some stages of carbohydrate metabolism are regulated by thiol enzymes such as triose-phosphate dehydrogenase and succinic dehydrogenase. They also feel that halogenated alkylating substances which may react with these thiol groups may have insecticidal action. The effect of a series of monohalogenated acetic acids and some of their salts and esters has been studied. All have been shown to be active against strains of houseflies highly resistant to DDT and Chlordane. Knockdown was determined within 20-60 minutes at a concentration of insecticide of 2 g/m² applied to glass surfaces.

The systematics of the Musca group are being studied by D.G. Sacca. A statistical evaluation of the morphologic characters used in identification may result in a complete revision of the classification of the group. Research on several strains has already been partly completed. One hundred per cent crossings have been reported with M. domestica and M. vicina; 50 per cent successful crossings have been obtained with M. domestica and M. nebulo and with M. vicina and M. nebulo. The offsprings of these crossings were 100 per cent fertile for at least two generations. This would suggest specific identity in the three forms but further studies are underway before definite conclusions can be made.

PULSATIONS OF THE GREAT VEINS

D.A. McDonald, E.P. Helps, and A.M. Fergusson of St. Bartholomew's Hospital, London, have been using high-speed photography (1500 frames/sec.) to record pulsations of the great veins.

An exposed rabbit's heart illuminated by a concentrated light source was used. On projection, movement is slowed approximately 100 times so that the sequence of all phases of the cardiac cycle may be seen. Pulsations were observed in the large venous trunks; the most marked were those of the left anterior vena cava. The timing of the pulsation is such that emptying of the vein occurs in atrial systole and is clearly due to active contraction. Dilatation of the vein occurs during diastole and it fills at the same time as the atrium. Reflux into the vein from the heart plays a major role in distending the vein and in one sequence this reflux appears to begin during ventricular systole. Movements of the vein can be seen from the pericardium intact or after opening it and the pulsations are almost as large after ligation of the vein at the level of the arch of the aorta.

The region pulsating usually extends somewhat beyond the pericardial attachment. Histologic preparations show that there is cardiac muscle surrounding the region of the vena cava that shows active contraction.

TECHNICAL REPORTS OF ONRL

The following reports have been forwarded to ONR, Washington, since the last issue of ESN. Copies may be obtained from the Technical Publications Office, Code 250, Office of Naval Research, Washington 25, D.C.

ONRL-136-52 "The Pneumoconiosis Research Unit, Llandough Hospital, Near Cardiff, Wales", by J.L. Tullis

FORTHCOMING EVENTS


The following list of forthcoming events in Europe for 1953 is compiled according to information available as of 15 December 1952:

<u>Date</u>	<u>Meeting</u>	<u>Place</u>
23-26 March	Annual General Meeting, Institute of Metals. 25 March an all-day Symposium on "The Control of Quality in the Production of Wrought Non-Ferrous Metals."	London
27 March	Royal Aeronautical Society, Symposium on "Fatigue of Metals".	London
12-16 April	The Ergonomics Research Society "The Measurement of Human Performance".	Oxford
14-15 April	Society for General Microbiology Symposium	London
15 April	Royal Meteorological Society Annual General Meeting	London
15-17 April	Commission on Optics of the International Union of Pure and Applied Physics, "Colloquium on Vision in its Relation to Instrumental Optics".	Madrid
May	World Health Organization Sixth World Health Assembly	Geneva
14-17 May	German Bunsen Association - General Assembly	Duisburg
21-23 May	Second European Congress of Allergy	Copenhagen
22-23 May	International Meeting of National Obstetrical and Gynaecological Associations	Paris
June	European Congress for Chemical Engineering	Paris
2-6 June	Oil and Color Chemists Association, "The Optical Properties of Films of Surface Coating Materials".	Eastbourne, England

<u>Date</u>	<u>Meeting</u>	<u>Place</u>
5-6 June	International Congress of Audiology	Groningen, Netherlands
8-15 June	Fifth International Congress of Otorhinolaryngology	Amsterdam
16-24 June	International Congress of Electro-acoustics and Symposium on the Sound Insulation of Light-Weight Structures. Netherlands Acoustical Society, under auspices of the Commission on Acoustics of the International Union of Pure and Applied Physics.	The Hague Hilversum, Delft, Eindhoven
July	Congress of the International Hospital Federation	Oxford or Cambridge
5-11 July	Colloquium on Cosmic Rays, Commission on Cosmic Rays of the International Union of Pure and Applied Physics	Bagnères de Bigorre, France
13-18 July	Second Symposium on Cosmical Gasdynamics, International Union of Theoretical and Applied Mechanics and International Astronomical Union.	Cambridge, England
14-19 July	International Congress of Radiobiology	Copenhagen
19-25 July	Seventh International Congress of Radiology	Copenhagen
26-31 July	Second International Congress of Rheology	Oxford
27 July - 1 Aug.	International Association of Psychotechnology, 11th Congress	Paris
29 July - 4 Aug.	XIIIth International Congress of Pure and Applied Chemistry; XVIIth Conference of the Union; Symposium on Chemistry of Wood and Wood Constituents.	Stockholm
3-7 Aug.	IUHS, VIIth International Congress of the History of Science	Jerusalem
5-7 Aug.	Symposium on Macromolecules	Uppsala
5-12 Aug.	International Zoological Congress and Meeting of the International Commission on Zoological Nomenclature	Copenhagen

<u>Date</u>	<u>Meeting</u>	<u>Place</u>
9-15 Aug.	Fifteenth International Veterinary Congress	Stockholm
19 Aug.	XIth International Congress of Limnology	Cambridge
24-28 Aug.	8th International Congress on Rheumatic Diseases; Connective Tissues and Rheumatism; Steroids in the Treatment of Rheumatism; End-results of Surgery for the Rheumatic Hip; Occupational Rehabilitation	Geneva
Aug.	9th International Congress of Genetics	Bellagio, Italy
28 Aug. - 4 Sept.	5th International Congress of Tropical Medicine and Malaria	Istanbul
31 Aug. - 5 Sept.	World Medical Association, 7th General Assembly	Amsterdam
Sept.	XIth International Ornithological Congress	Switzerland
1-5 Sept.	International Congress on Biometry	Bellagio, Italy
6-12 Sept.	6th International Congress of Microbiology	Rome
15-20 Sept.	15th Congress of the International Society of Surgery	Lisbon
19-25 Sept.	Royal Photographic Society. International Conference.	London
3-10 Oct.	6th International Leprosy Congress	Madrid

Prepared by the Scientific Staff
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